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Healthcare Waste Management Practices of Private Hospitals in the First District of Ilocos Sur

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Index Terms:

healthcare facility waste practices, hospital operational factors, institutional waste management systems, waste segregation compliance, medical waste handling procedures, environmental safety in hospitals, healthcare waste governance.

Abstract. Healthcare waste generated by hospitals poses significant environmental and public health risks when not properly managed. Effective healthcare waste management systems are therefore essential to ensure safe handling, treatment, and disposal of hazardous materials. This study assessed the level of healthcare waste management practices of private hospitals in the first district of Ilocos Sur and examined their relationship with selected personal-related factors, hospital-related characteristics, and institutional healthcare waste management–related factors. A descriptive quantitative research design was employed involving 160 respondents composed of management personnel or Pollution Control Officers, medical staff, and utility workers from eleven private hospitals. Data were collected using a structured survey questionnaire and institutional records. Statistical tools used in the analysis included frequency and percentage distributions, weighted means, and correlation analysis. Findings showed that healthcare waste management practices were implemented at a high level (grand mean = 3.83). Waste segregation obtained the highest rating (mean = 3.88), while waste minimization recorded the lowest rating among practice areas (mean = 3.66). Personal-related factors showed no significant relationship with overall waste management practices. In contrast, hospital-related characteristics—particularly level classification (r = .91), total waste generated (r = .89), and bed capacity (r = .86)—demonstrated strong positive relationships with implementation. Institutional factors such as guidelines, supervision, budget allocation, and waste management utilities also showed strong associations with effective practices. The findings highlight the critical role of organizational systems, institutional capacity, and operational resources in strengthening healthcare waste management in private hospitals. Effective policies, adequate funding, trained personnel, and sufficient waste management utilities collectively support the consistent implementation of safe and compliant waste handling practices.

Introduction

Healthcare waste management has become an increasingly important concern in healthcare administration, environmental health, and public safety due to the potential hazards associated with improper handling, treatment, and disposal of hazardous materials generated by healthcare facilities. Hospitals generate a variety of waste streams—including infectious, pathological, pharmaceutical, and chemical wastes—that can pose serious risks to healthcare workers, patients, and surrounding communities if not properly managed. Effective healthcare waste management systems are therefore necessary to ensure safe waste handling practices, reduce occupational exposure, and prevent environmental contamination (Windfeld & Brooks, 2019; World Health Organization, 2020).

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Previous research has consistently emphasized that effective healthcare waste management depends on a combination of operational practices and institutional support mechanisms. Key operational components include proper segregation at the point of generation, safe collection and storage procedures, controlled transportation systems, appropriate treatment technologies, and compliant disposal practices (Chartier, 2014; Kenny & Priyadarshini, 2021). In addition, institutional factors—such as the presence of operational guidelines, supervision mechanisms, training programs, and availability of waste management utilities—play a critical role in strengthening healthcare waste management systems within healthcare facilities (Al-Khatib et al., 2020; Lee & Lee, 2022).

Across the literature, there is strong agreement that healthcare facilities with established governance structures, adequate infrastructure, and organized monitoring systems demonstrate higher levels of compliance with healthcare waste management standards (Caniato et al., 2019; Raji & Adeogun, 2024). Institutional mechanisms such as waste management committees, supervision systems, and structured training programs help translate policies into operational practices and promote accountability within healthcare organizations (Gull et al., 2024; Harhay et al., 2020). However, studies also report variations in implementation across healthcare facilities, particularly in relation to hospital capacity, service coverage, waste generation levels, and resource availability (Dang et al., 2020; Paudel et al., 2023).

Despite the growing body of research on healthcare waste management, many existing studies focus primarily on large tertiary hospitals or public healthcare institutions. Comparatively fewer studies examine how private hospitals—especially those operating in provincial settings—implement healthcare waste management practices and how institutional and operational factors influence these systems (Wassie et al., 2022; Tadesse & Dolamo, 2022). Given the increasing role of private healthcare facilities in healthcare service delivery, understanding these dynamics is important for strengthening environmental health governance and healthcare waste management systems.

In the Philippines, healthcare waste management is governed by national policies that require healthcare facilities to implement safe waste segregation, treatment, and disposal procedures to protect public health and the environment. However, variations in institutional capacity, operational resources, and organizational systems among healthcare facilities may influence how these standards are implemented in practice. Examining healthcare waste management practices in private hospitals therefore provides valuable insights into how institutional systems and operational factors shape waste management outcomes.

Accordingly, this study examines the level of healthcare waste management practices of private hospitals in the first district of Ilocos Sur and analyzes how personal-related factors, hospital-related characteristics, and healthcare waste management–related institutional factors are associated with these practices. Specifically, the study addresses the following questions: (1) What is the profile of respondents and participating hospitals in terms of personal-related and hospital-related factors? (2) What is the level of healthcare waste management practices across key operational areas? and (3) Are healthcare waste management practices significantly associated with personal-related factors, hospital-related factors, and institutional healthcare waste management–related factors?

The findings of this study contribute to the growing body of knowledge on healthcare waste management and may inform institutional policy development, environmental health planning, and operational improvements in healthcare waste management systems within private healthcare facilities. The remainder of this paper is organized as follows: the Methods section describes the research design and data collection procedures, the Results section presents the empirical findings, and the Discussion section interprets the results and their implications for healthcare waste management policy and practice.

Methodology

This section of the research discusses the research design, population and sample, data gathering instrument, data-gathering procedure, ethical considerations, and statistical treatment of data that were used in the study.

Research Design.

This research study used the descriptive-correlational method of research. This is the appropriate approach to describe the characteristics of the respondents, the level of healthcare waste management-related factors, and the level of healthcare waste management practices of private hospitals in the first district of Ilocos Sur. The study also employed simple linear

correlation to measure the significant relationship between the personal-related and hospital-related factors and the level of healthcare waste management practices of private hospitals in the first district of Ilocos Sur.

Population and Sample.

This study was conducted among private hospitals in the first district of Ilocos Sur with its hospital staff as respondents. The study included a total of 11 hospital management/pollution control officers (or their equivalents), selected medical staff through convenience sampling, and 34 utility workers through total enumeration.

Table 1 presents the distribution of respondents in the private hospitals in the first district of Ilocos Sur.

Private Hospitals	**Hospital Management/ PCO (or equivalent)**	**Utility Workers**	**Medical Staff (Nurses/ Medical Technologies)**	**Total**
	N	**N**	**n**	
Metro Vigan Hospital	1	7	23	31
Northside Doctors Hospital	1	5	15	21
St James Hospital	1	2	9	12
Rabara Clinic & Hospital	1	3	6	10
Ilocos Sur Medical Mission Cooperative Hospital	1	3	9	13
Recel Clinic and Hospital	1	1	2	4
Tolentino Clinic and Hospital	1	2	8	11
Suero General Hospital	1	3	11	15
Pira Hospital	1	2	13	16
Corpuz Clinic and Hospital	1	3	11	15
Sto. Cristo Milagroso Hospital	1	3	8	12
TOTAL	**11**	**34**	**115**	**160**

Table 1. Distribution of respondents

Data Gathering Instrument

In this study, a questionnaire-checklist was employed as the main data-gathering instrument, which was adopted from the World Health Organization (WHO) manual. The questionnaire is composed of four (4) parts to come up with the desired output.

Part I is composed of checklist items designed to identify the personal-related factors of the respondents across age, sex, length of service, highest educational attainment, and number of related training programs. Moreover, the checklist items are also intended to determine the hospital-related factors of the private hospitals in the first district of Ilocos Sur, including location, bed capacity, level, services offered, permits and licenses, and total waste generation per day.

Part II is comprised of checklist items to assess the level of healthcare management-related factors across budget allocation, presence of guidelines, training manuals, supervision, presence of a waste management committee, and availability of waste management utilities, which was adopted from the study of Wassie et al. (2022).

Part III is composed of checklist items designed to assess the level of healthcare waste management practices of private practices along segregation, collection, storage, transportation, treatment, disposal, waste minimization, documentation and reporting, and occupational safety and personal protective equipment, which was also adopted from the World Health Organization's 2014 Manual.

Part IV is comprised of statements designed to determine the financial and operational challenges or barriers encountered by private hospitals in the implementation of healthcare waste management practices. This section is divided into two categories, namely financial challenges and operational challenges, with ten (10) items for each category. The items were adopted from the World Health Organization's (2014) manual.

The following norms were used in the interpretation of data:

On the level of healthcare waste management-related factors and financial and operational challenges faced by the private hospitals in healthcare waste management:

Statistical Range	Item Descriptive Rating	Overall Descriptive Rating
4.21-5.00	Strongly Agree (SA)	Very High (VH)
3.41-4.20	Agree (A)	High (H)
2.61-3.40	Neutral (N)	Fair (F)
1.81-2.60	Disagree (D)	Low (L)
1.00-1.80	Strongly Disagree (S)	Very Low (VL)

On the level of healthcare waste management practices:

Statistical Range	Item Descriptive Rating	Overall Descriptive Rating
4.21-5.00	Very Highly Practiced (VHP)	Very High (VH)
3.41-4.20	Highly Practiced (HP)	High (H)
2.61-3.40	Sometimes Practiced (SP)	Fair (F)
1.81-2.60	Rarely Practiced (RP)	Low (L)
1.00-1.80	Never Practiced (NP)	Very Low (VL)

Data Gathering Procedure.

The researcher requested permission to float a questionnaire from the Chief Executive Officer of each private hospital through a communication letter, and a consent form was given to the respondents for their participation. The researcher likewise personally distributed the questionnaire to the respondents, after which the researcher retrieved the instrument from the pertinent respondents.

Statistical Treatment of Data.

The statistical tools employed in the treatment of the data gathered are the following:

1. Frequency and percentage to describe the personal and hospital profile.
2. Mean to describe the level of healthcare waste management-related factors and level of healthcare waste management practices of private hospitals in the first district of Ilocos Sur.

Simple-linear correlation to identify the significant relationship between the personal and hospital profile and the level of healthcare waste management practices as well as the significant relationship between the level of healthcare waste management-related factors and healthcare waste management practices.

Results and Discussion

Personal-related Factors

Table 2 shows the profile of the respondents from various private hospitals in the first district of Ilocos Sur in terms of age, sex, length of service, employment status, highest educational attainment, and number of related training programs. This table gives a clear representation of the people who are actually involved in healthcare waste management in private hospitals in the first district of Ilocos Sur.

Variables	*f*	%
Age		
21–29 years	64	40.00
30–39 years	65	40.57
40–49 years	27	17.14

50–59 years	4	2.29
Total	**160**	**100**
Sex		
Male	102	64.00
Female	58	36.00
Total	**160**	**100**
Length of Service		
0–5 years	100	62.86
6–10 years	43	26.86
11–15 years	14	8.57
16–20 years	3	1.71
Total	**160**	**100**
Employment Status		
Regular	123	77.14
Probationary	37	22.86
Total	**160**	**100**
Highest Educational Attainment		
Master's Degree with Doctorate units	1	0.57
Master's Degree	14	8.57
Bachelor's Degree with MA units	26	16.00
Bachelor's Degree	100	62.86
Others	19	12.00
Total	**160**	**100**
Number of Related Training Programs		
0–1 training	36	22.86
2–3 trainings	62	38.86
4–5 trainings	36	22.29
6–10 trainings	25	15.43
11+ trainings	1	0.57
Total	**160**	**100**

Table 2. Personal-Related Factors

Taken together, the profile of respondents suggests that healthcare waste management activities in the participating private hospitals are primarily carried out by a relatively young and operationally active workforce with moderate professional experience and exposure to training programs. The predominance of personnel with bachelor's degrees and participation in several related training activities may contribute to the ability of hospital staff to comply with established waste management procedures. Previous studies have emphasized that workforce training and operational experience play an important role in improving healthcare waste management practices, particularly in areas such as waste segregation, storage, and safe handling procedures (Ibrahim et al., 2023; Paudel et al., 2023). However, the relatively short length of service among many respondents may also indicate the need for continuous training and supervision to ensure consistent adherence to institutional waste management protocols. Understanding these characteristics is important because personnel involved in waste handling and operational activities directly influence the effectiveness of healthcare waste management systems within healthcare facilities (Windfeld & Brooks, 2019; Raji & Adeogun, 2024).

Hospital-related Factors

The hospital profile provides a clear understanding of the different settings where healthcare waste management practices are being implemented in the first district of Ilocos Sur.

Table 3 shows the profile of various private hospitals in the first district of Ilocos Sur in terms of location, bed capacity, level, services offered, permits and licenses, and total waste generation per day.

Location	***f***	**%**
Vigan City	3	27.27
Bantay	2	18.18
Cabugao	2	18.18
Sinait	2	18.18
Sta. Catalina	1	9.09
Sto. Domingo	1	9.09
Total	**11**	**100**
Bed Capacity		
≤25 beds	5	45.45
26–50 beds	4	36.36
51–100 beds	2	18.18
Total	**11**	**100**
Level Classification		
Level 2	2	18.18
Level 1	6	54.55
Infirmary	3	27.27
Total	**11**	**100**
Services Offered		
≤10 services	5	45.45
11–20 services	3	27.27
21–30 services	1	9.09
31+ services	2	18.18
Total	**11**	**100**
Permits and Licenses		
3–4 permits/licenses	11	100
TOTAL	**11**	**100**
Total Waste Generated Per Day		
More than 80 kg	2	18.18
41–60 kg	1	9.09
21–40 kg	5	45.45
20 kg or less	3	27.27
Total	**11**	**100**

Table 3. Hospital-Related Factors

Table 3 presents the profile of private hospitals in the first district of Ilocos Sur in terms of location, bed capacity, level classification, services offered, permits and licenses, and total waste generated per day. These institutional characteristics provide important context for understanding the healthcare settings in which waste management practices are implemented.

In terms of location, hospitals are distributed across several municipalities, with the largest proportion located in Vigan City (27.27%). Bantay, Cabugao, and Sinait each account for 18.18% of the hospitals, while Sta. Catalina and Sto. Domingo each have one hospital (9.09%). This distribution indicates that the participating healthcare facilities are geographically dispersed across the district.

Regarding bed capacity, most hospitals are relatively small institutions. Nearly half (45.45%) have 25 beds or fewer, while 36.36% have bed capacities between 26 and 50 beds. Only two hospitals (18.18%) have capacities ranging from 51 to 100 beds. Similarly, the majority of hospitals are classified as Level 1 facilities (54.55%), followed by infirmaries (27.27%) and Level 2 hospitals (18.18%), suggesting that most facilities primarily provide basic healthcare services.

In terms of services offered, five hospitals (45.45%) provide ten or fewer services, while others offer between eleven and more than thirty-one services. All hospitals reported possessing three to four required permits and licenses, indicating compliance with regulatory standards for healthcare facility operations.

With respect to total waste generated per day, the largest proportion of hospitals (45.45%) generate between 21 and 40 kilograms of healthcare waste daily. Meanwhile, 27.27% produce 20 kilograms or less, and only a small number generate larger volumes exceeding 80 kilograms.

Overall, the profile suggests that most participating hospitals are small to medium-sized healthcare institutions with limited bed capacity and a moderate range of services. These characteristics influence the scale and organization of healthcare waste management systems within hospitals. Previous studies indicate that hospital capacity, service coverage, and waste generation levels significantly affect the structure and complexity of waste management practices (Dang et al., 2020; Paudel et al., 2023). Larger hospitals typically require more structured waste management systems due to higher waste volumes, while smaller facilities operate simpler systems but must still maintain compliance with environmental and public health regulations (Windfeld & Brooks, 2019; Raji & Adeogun, 2024).

Level of Healthcare Waste Management-Related Factors

Table 4 presents the overall assessment of healthcare waste management–related factors across private hospitals in the first district of Ilocos Sur, covering budget allocation, presence of guidelines, training manuals, supervision, presence of a waste management committee, and availability of waste management utilities.

Healthcare Waste Management-Related Factors	**Management/PCO**		**Utility Worker**		**Medical Staff**		**As a Whole**	
	Mean	**DR**	**Mean**	**DR**	**Mean**	**DR**	**Mean**	**DR**
1. Budget Allocation	3.92	H	3.76	H	3.81	H	3.82	**H**
2. Presence of Guidelines	4.01	H	3.80	H	3.89	H	3.89	**H**
3. Training Manuals	3.83	H	3.67	H	3.76	H	3.76	**H**
4. Supervision	4.02	H	3.76	H	3.83	H	3.84	**H**
5. Presence of Waste Management Committee	3.97	H	3.81	H	3.88	H	3.88	**H**
6. Availability of Waste Management Utilities	4.05	H	3.75	H	3.89	H	3.89	**H**
Grand Mean	**3.97**	**H**	**3.76**	**H**	**3.84**	**H**	**3.85**	**H**

Table 4. Level of Healthcare Waste Management-Related Factors of Private Hospitals in the First District of Ilocos Sur

Taken together, the findings show that healthcare waste management–related factors are practiced at a high level (grand mean of 3.85). This indicates that private hospitals have already established the necessary factors for effective healthcare waste management implementation. This demonstrates their commitment to environmental safety, occupational health, and regulatory compliance. These systems provide the structure through which better waste management policies are implemented in their day-to-day activity

The presence of guidelines and availability of waste management utilities also recorded the highest overall means (3.89). This indicates that these two factors are strongly evident across the participating hospitals. This suggests that most facilities have established written policies and procedural guidelines that direct healthcare waste handling practices. Such guidelines likely provide clear instructions on segregation, collection, storage, transport, treatment, and disposal, thereby promoting consistency and compliance within the institution.

Among the factors, training manuals recorded the lowest overall mean (3.76), although it was still interpreted as "High." This indicates that while they have written training manuals, their use and coverage are not that high. This is seen in the results under the training manuals, especially in the availability of PPE. Utility workers, in particular, gave lower ratings, which may reflect that they do not always refer to these manuals.
Across all respondent categories, management/PCO reported the highest perceptions (grand mean = 3.97), followed by medical staff (3.84) and utility workers (3.76). This ranking suggests that administrators (management/PCO) of these private hospitals tend to have their healthcare waste management systems well established. While operational personnel

(Utility Workers) experience challenges in its implementation. Utility workers' responses may reflect factors affecting waste management impediments.

While the overall results are positive, they also point to several gaps that require attention. Budget remains a concern, particularly in putting up infrastructure, utilities, and conducting trainings. There are available training manuals in these hospitals, but they may not always be used or referred to in actual practice. Supervision may not be consistently practiced. And assigned committees do not always involve all the departments/units. These gaps suggest that there are excellent systems in place but may require strengthening to ensure uniform implementation across all units in the hospital.
Ultimately, the findings demonstrate that private hospitals in the first district of Ilocos Sur have developed a very good healthcare waste management structure. Organizational support through policies, resources, supervision, and committees is evident.

Level of Healthcare Waste Management Practices of Private Hospitals in the First District of Ilocos Sur

Table 5 presents the overall level of healthcare waste management practices of private hospitals in the first district of Ilocos Sur across key functional areas, including segregation, collection, storage, transportation, treatment, disposal, minimization, documentation and reporting, and occupational safety and PPE.

Healthcare Waste Management Practices	**Management/PCO**		**Utility Worker**		**Medical Staff**		**As a Whole**	
	Mean	**DR**	**Mean**	**DR**	**Mean**	**DR**	**Mean**	**DR**
1. Waste Segregation	4.04	H	3.66	H	3.90	H	3.88	**H**
2. Waste Collection	4.00	H	3.71	H	3.88	H	3.86	**H**
3. Waste Storage	3.99	H	3.64	H	3.85	H	3.83	**H**
4. Waste Transportation	3.98	H	3.64	H	3.85	H	3.82	**H**
5. Waste Treatment	3.96	H	3.56	H	3.84	H	3.79	**H**
6. Waste Disposal	3.98	H	3.58	H	3.84	H	3.80	**H**
7. Waste Minimization	3.86	H	3.4	F	3.73	H	3.66	**H**
9. Documentation and Reporting	4.03	H	3.57	H	3.87	H	3.82	**H**
10. Occupational Safety and PPE	4.02	H	3.63	H	3.87	H	3.84	**H**
Grand Mean	**3.99**	**H**	**3.60**	**H**	**3.85**	**H**	**3.83**	**H**

Table 5. Level of Healthcare Waste Management Practices of Private Hospitals in the First District of Ilocos Sur

As a whole, the findings show that healthcare waste management practices among private hospitals in the first district of Ilocos Sur are implemented at a high level, with an overall grand mean of 3.83. This means that, in general, hospitals in the area are able to carry out proper waste segregation, collection, storage, and disposal as part of their everyday operations. In the local setting, waste management is not treated as a separate task but as a routine responsibility shared by healthcare workers, utility staff, and administrators to keep the hospital environment safe for patients and the community.

This level of implementation also reflects how hospitals are guided by national policies. Practices are anchored on the DOH Health Care Waste Management Manual and reinforced by the Joint DOH–DENR Administrative Order No. 02, s. 2005, which requires safe handling, transport, treatment, and disposal of healthcare waste. Even with limitations in manpower and resources that are common among private hospitals in the province, facilities still strive to comply with these standards as part of licensing, accreditation, and environmental responsibility.

Waste segregation obtained the highest overall mean of 3.88. This indicates that segregation is the most consistently practiced component of healthcare waste management among the participating hospitals. The result suggests that proper separation of waste at the point of generation, such as using color-coded bins and following established protocols, is already well integrated into daily hospital operations. This strong performance may be attributed to continuous staff orientation, visible guidelines, and the routine nature of segregation in clinical areas, making it easier for personnel to comply and sustain the practice.

On the other hand, waste minimization recorded the lowest overall mean of 3.66. Although still interpreted as high, the comparatively lower score implies that initiatives aimed at reducing waste generation are not as consistently implemented as other waste management practices. Minimization often requires broader institutional strategies such as resource efficiency, procurement controls, and behavior change, which may be more challenging to operationalize than routine practices like segregation and collection. This finding suggests an opportunity for hospitals to strengthen programs that promote reduction, reuse where appropriate, and more sustainable consumption of medical supplies.
Looking at the results by respondent type provides a clearer picture of how waste management is experienced across different roles in the hospital.

Management and Pollution Control Officers (PCOs) posted the highest grand mean of 4.02. This suggests strong confidence in the systems already in place—such as established protocols, coordination with accredited waste service providers, and compliance with DOH and DENR requirements. From their standpoint, waste management is supported by policies, planning, and monitoring mechanisms.

Medical staff recorded a grand mean of 3.87, also interpreted as high. For nurses, physicians, and allied health workers, waste management is part of daily patient care—especially proper segregation at the source and adherence to infection control practices. Their responses show that these practices are already embedded in routine clinical work.
On the other hand, utility workers reported a slightly lower grand mean of 3.63, though still within the high range. Their perspective reflects the realities of those who actually collect, transport, and manage waste across hospital areas. Factors such as workload, time pressure, inconsistent segregation at the source, and the physical demands of the job may influence how they view the effectiveness of waste management practices. Being at the frontline, they are more likely to notice operational gaps that are not always visible at the administrative level.

The differences in the grand means simply show that each group experiences healthcare waste management in different ways—management from a policy and compliance perspective, medical staff through clinical practice, and utility workers through hands-on implementation.

Overall, the grand mean of 3.83, together with the respondent-specific results of 4.02 for management/PCO, 3.87 for medical staff, and 3.63 for utility workers, shows that healthcare waste management practices in private hospitals in the first district of Ilocos Sur are generally well-established and consistently practiced. The findings reflect a shared commitment to maintaining safe waste handling systems in line with DOH and DENR standards, while also reminding institutions to continue supporting frontline workers and strengthening day-to-day implementation.

Significant relationship between the level of HCW management practices of private hospitals in the first district of Ilocos Sur and personal-related factors

Table 6 presents the correlation showing the relationship between personal-related and the level of healthcare waste management practices in terms of segregation, collection, storage, transportation, treatment, disposal, minimization, documentation and reporting, occupational safety and personal protective equipment (PPE), and the overall composite score. The table indicates the strength and direction of the relationships using correlation coefficients, where values closer to ±1 signify stronger relationships. A positive coefficient indicates that as the factor increases, the level of healthcare waste management practices also increases.

	Healthcare Waste Management Practices									
Personal-Related Factors	**Segregation**	**Collection**	**Storage**	**Transport**	**Treatment**	**Disposal**	**Minimization**	**Documentation**	**Occupational Safety & PPE**	**As a Whole**
1. Age	-.06	.07	.03	.05	.05	.06	.05	.06	.03	.05
2. Sex	.16*	.02	.07	-.01	-.01	.06	-.01	.03	-.02	.02
3. Length of Service	.10	.04	.08	.06	.07	.06	.06	.08	.08	.07
4. Employment Status	.03	.06	.01	.03	.03	.03	.04	.03	.03	.04
5. Highest Educational Attainment	-.43**	.03	.05	-.01	-.01	.04	.03	.04	.07	.02

6. Number of Related Training Programs	.25**	.11	.16*	.10	.13	.10	.11	.09	.11	.13

Table 6. Correlation Between Personal Related Factors and Healthcare Waste Management Practices

Legend: **. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Overall, the results reveal that most personal-related factors do not have a statistically significant relationship with the overall healthcare waste management practices of respondents in private hospitals in the first district of Ilocos Sur. Specifically, age, sex, length of service, employment status, highest educational attainment, and number of related training programs showed no significant correlation with healthcare waste management practices when considered as a whole.
This finding suggests that the implementation of healthcare waste management practices is generally consistent among respondents regardless of their personal characteristics. Such uniformity may be attributed to the presence of institutional guidelines, standardized procedures, and organizational supervision within hospitals, which ensure that waste management protocols are followed by all personnel regardless of demographic differences. The World Health Organization (2020) emphasized that effective healthcare waste management largely depends on institutional policies, regulatory compliance, and systematic monitoring rather than solely on individual characteristics of healthcare workers.

Although some significant relationships were observed in specific components, particularly in waste segregation and storage, these relationships were not strong enough to influence the overall level of healthcare waste management practices. This implies that while training and educational background may contribute to improvements in certain operational aspects, the overall practice of healthcare waste management is more likely shaped by institutional systems and organizational policies rather than individual personal factors. Similar findings were reported by Windfeld and Brooks (2019) and Raji and Adeogun (2024), who noted that structured management systems and institutional support mechanisms play a more decisive role in ensuring compliance with healthcare waste management standards.

Among the variables, the strongest correlation was observed between healthcare waste management practices, particularly segregation and highest educational attainment ($r = –.43$, $p < .01$). This moderate negative relationship suggests that higher educational attainment did not necessarily correspond to better performance in segregation practices. This may indicate that effective healthcare waste management relies more on task-specific orientation, routine compliance, and adherence to established procedures rather than on formal academic preparation alone. According to Chartier (2014) and Kenny and Priyadarshini (2021), proper waste segregation in healthcare settings is primarily achieved through operational training, strict supervision, and clear procedural guidelines rather than educational attainment alone.

In addition, the number of related training programs attended showed a significant positive relationship with segregation ($r = .25$, $p < .01$) and storage ($r = .16$, $p < .05$), highlighting that personnel who undergo more training tend to demonstrate better adherence to proper waste management procedures. This finding supports the conclusions of Ibrahim et al. (2023) and Paudel et al. (2023), who emphasized that training and continuous capacity-building programs significantly improve healthcare workers' compliance with waste segregation and storage protocols.

Sex exhibited a significant yet weak correlation with segregation ($r = .16$, $p < .05$), indicating minor variations in the execution of waste management practices. However, the weak magnitude of the correlation indicates that such differences are minimal and do not substantially influence the overall implementation of healthcare waste management practices.
On the other hand, the weakest correlations were observed between healthcare waste management practices and age, employment status, and length of service. These variables consistently produced very low correlation coefficients across segregation, collection, storage, transportation, treatment, disposal, minimization, documentation, and occupational safety and personal protective equipment. This indicates that demographic characteristics and tenure in service have minimal influence on how healthcare waste management practices are implemented. Similar observations were reported by Tadesse and Dolamo (2022) and Mogaka et al. (2023), who found that demographic factors such as age and length of service do not necessarily predict compliance with healthcare waste management procedures.

Overall, the findings suggest that healthcare waste management practices are more closely associated with training exposure and institutional systems than with inherent personal characteristics. While education and sex showed limited influence in specific aspects, most personal-related factors demonstrated negligible relationships with overall practices. This reinforces the idea that effective healthcare waste management is largely shaped by organizational policies,

standardized procedures, regulatory compliance, and continuous training initiatives, rather than by individual attributes alone.

Significant relationship between the level of HCW management practices of private hospitals in the first district of Ilocos Sur and hospital-related factors

Table 7 presents the correlation showing the relationship between hospital-related factors and the level of healthcare waste management practices in terms of segregation, collection, storage, transportation, treatment, disposal, minimization, documentation and reporting, occupational safety and personal protective equipment (PPE), and the overall composite score. The table indicates the strength and direction of the relationships using correlation coefficients, where values closer to ±1 signify stronger relationships. A positive coefficient indicates that as the factor increases, the level of healthcare waste management practices also increases.

Hospital-Related Factors	Healthcare Waste Management Practices									
	Segregation	**Collection**	**Storage**	**Transportation**	**Treatment**	**Disposal**	**Minimization**	**Documentation**	**Occupational Safety & PPE**	**As a Whole**
1. Location	.03	-.61**	-.46**	-.52**	-.52**	-.51**	-.52**	-.60**	-.48**	-.56**
2. Bed Capacity	-.01	.86**	.83**	.78**	.73**	.83**	.81**	.82**	.80**	.86**
3. Level Classification	-.02	.88**	.83**	.86**	.83**	.86**	.84**	.88**	.85**	.91**
4. Services Offered	.01	.78**	.821**	.75**	.80**	.79**	.79**	.81**	.79**	.85**
5. Permits and Licenses	.b	.b	.b	.b	.b	.b	.b	.b	.b	.b
6. Total Waste Generated per Day	-.01	.88**	.83**	.85**	.78**	.83**	.84**	.85**	.82**	.89**

Table 7. Correlation Between Healthcare Waste Management Practices and Hospital-Related Factors

The correlation analysis revealed that, when considered as a whole, healthcare waste management practices were significantly related to several hospital-related factors. The strongest relationships were observed with level classification ($r = .91$, $p < .01$), total waste generated per day ($r = .89$, $p < .01$), bed capacity ($r = .86$, $p < .01$), and services offered ($r = .85$, $p < .01$). These results indicate very strong positive correlations, suggesting that hospitals with higher levels of classification, larger bed capacities, greater service coverage, and higher volumes of waste generation tend to demonstrate more developed and structured healthcare waste management practices. This finding implies that hospitals with greater institutional capacity and operational complexity are more likely to establish comprehensive systems and procedures for managing healthcare waste. This observation supports the findings of Windfeld and Brooks (2019) and Raji and Adeogun (2024), who emphasized that healthcare facilities with greater operational capacity tend to develop more systematic and organized healthcare waste management systems due to the complexity and volume of waste generated.

Across the specific dimensions of healthcare waste management practices, several significant relationships were also observed. Bed capacity showed strong positive correlations with collection, storage, transportation, treatment, disposal, minimization, documentation, and occupational safety and personal protective equipment. This suggests that hospitals with larger bed capacities are more likely to implement structured procedures across different stages of waste management. Larger facilities generate greater quantities of healthcare waste, which necessitates organized handling, treatment, and disposal systems to ensure safety and regulatory compliance. This finding is consistent with the World Health Organization (2020) and Chartier (2014), which emphasized that larger hospitals often establish more comprehensive waste management systems due to the increased complexity of waste streams and operational demands.

Similarly, level classification demonstrated very strong positive correlations across several waste management dimensions. Higher-level hospitals typically provide specialized and advanced healthcare services that produce more complex forms of healthcare waste, including infectious, pathological, and pharmaceutical waste. As a result, these facilities tend to adopt more systematic waste management practices to address associated environmental and health risks. According to Kenny

and Priyadarshini (2021) and Lee and Lee (2022), advanced healthcare facilities generally implement stricter waste management protocols to ensure effective infection control and environmental protection.

In the same manner, services offered showed strong positive correlations with most healthcare waste management practices. Hospitals providing a wider range of medical services are likely to generate diverse types of healthcare waste, requiring more comprehensive management strategies across the waste management cycle. This finding supports the observations of Dang et al. (2020) and Paudel et al. (2023), who reported that healthcare facilities offering multiple clinical services tend to implement more comprehensive waste management systems to effectively handle different waste streams. Likewise, total waste generated per day exhibited strong positive correlations across several healthcare waste management dimensions. Hospitals that generate higher volumes of waste are more likely to establish systematic procedures for waste collection, treatment, and disposal in order to reduce environmental risks and protect public health. This finding aligns with the conclusions of Sepetis et al. (2022) and Sharifi et al. (2024), who emphasized that the volume of healthcare waste produced significantly influences the level of planning, infrastructure, and management practices implemented within healthcare institutions.

In contrast, location showed significant negative correlations with several dimensions, including collection, storage, transportation, treatment, disposal, minimization, documentation, and occupational safety and PPE. This indicates that the geographical location of hospitals does not necessarily strengthen healthcare waste management practices and may reflect variations in access to infrastructure, regulatory oversight, or technical support across different areas. Similar challenges were reported by Al-Khatib et al. (2020) and Raji and Adeogun (2024), who noted that disparities in infrastructure, resources, and institutional support across regions can influence the effectiveness of healthcare waste management practices.

Meanwhile, waste segregation did not show significant relationships with most hospital-related factors, suggesting that this practice is likely standardized and consistently implemented across hospitals regardless of their institutional characteristics. Waste segregation is widely recognized as a fundamental component of infection prevention and healthcare waste management and is often governed by standard protocols within healthcare institutions. Studies by Ibrahim et al. (2023) and Jangre et al. (2023) similarly reported that waste segregation practices are commonly implemented across healthcare facilities due to established guidelines and infection control policies.

Permits and licenses were not included in the correlation analysis due to uniformity in responses, as all hospitals reportedly possessed the required permits and licenses. With no variability in the data, correlation could not be established for this factor.

Overall, the findings demonstrate that healthcare waste management practices are strongly associated with institutional and operational characteristics of hospitals—particularly size, level classification, service capability, and volume of waste generated—while location shows comparatively weaker influence. This underscores that organizational capacity, resource availability, and operational scale play a critical role in shaping effective healthcare waste management systems. These findings are consistent with the broader literature, which highlights the importance of institutional infrastructure and management systems in ensuring safe and effective healthcare waste management (Windfeld & Brooks, 2019; WHO, 2020).

Significant relationship between the level of HCW management practices of private hospitals in the first district of Ilocos Sur and the level of HCW management-related factors

Table 8 presents the relationship between healthcare waste management–related factors in terms of budget allocation, presence of guidelines, training manuals, supervision, presence of a waste management committee, and availability of waste management utilities and the level of healthcare waste management practices across segregation, collection, storage, transportation, treatment, disposal, minimization, documentation, occupational safety and PPE, and the overall composite score. The positive correlation coefficients indicate that improvements in institutional support systems are associated with higher levels of healthcare waste management practices.

Healthcare Waste Management–Related Factors	Healthcare Waste Management Practices									
	Segregation	**Collection**	**Storage**	**Transportation**	**Treatment**	**Disposal**	**Minimization**	**Documentation**	**Occupational Safety & PPE**	**As a Whole**
1. Budget Allocation	.06	.83**	.86**	.78**	.76**	.85**	.84**	.81**	.83**	.88**
2. Presence of Guidelines	.07	.85**	.86**	.82**	.86**	.83**	.82**	.88**	.85**	.90**
3. Training Manuals	.06	.80**	.84**	.78**	.77**	.79**	.83**	.79**	.77**	.85**
4. Supervision	.09	.77**	.79**	.71**	.83**	.78**	.77**	.79**	.76**	.83**
5. Presence of Waste Management Committee	.11	.80**	.78**	.76**	.73**	.75**	.71**	.71**	.81**	.80**
6. Availability of Waste Management Utilities	.10	.82**	.76**	.86**	.80**	.77**	.81**	.81**	.82**	.86**
As a whole	**.08**	**.91****	**.91****	**.89****	**.90****	**.90****	**.90****	**.91****	**.90****	**.97****

Table 8. Correlation Between Healthcare Waste Management–Related Factors and Healthcare Waste Management Practices

The strongest correlation was observed in the overall relationship between healthcare waste management–related factors and healthcare waste management practices as a whole ($r = .97$, $p < .01$). This very high positive correlation indicates that the presence and strength of institutional support systems are strongly associated with the effective implementation of waste management practices. Among the individual factors, the presence of guidelines demonstrated the highest overall correlation with practices ($r = .90$, $p < .01$), followed by budget allocation ($r = .88$, $p < .01$), availability of waste management utilities ($r = .86$, $p < .01$), and training manuals ($r = .85$, $p < .01$). These findings suggest that when hospitals have clear written policies, sufficient financial resources, complete facilities and equipment, and structured reference materials, healthcare waste management practices are more consistently and effectively implemented. This observation supports the findings of Windfeld and Brooks (2019) and Kenny and Priyadarshini (2021), who emphasized that well-established institutional systems, clear guidelines, and adequate infrastructure are essential components of effective healthcare waste management programs.

Across specific practice areas—collection, storage, transportation, treatment, disposal, minimization, documentation, and occupational safety and PPE—all related factors showed strong and significant positive correlations. Notably, documentation had very high correlations with the presence of guidelines ($r = .88$, $p < .01$) and with the combined related factors ($r = .91$, $p < .01$), indicating that clear policies and structured systems strongly support proper record-keeping and reporting. Proper documentation is an essential component of healthcare waste management because it ensures accountability, traceability, and compliance with regulatory standards.

Similarly, storage and collection practices demonstrated strong associations with budget allocation and guidelines, reinforcing the importance of financial and procedural support in operational implementation. Adequate funding allows hospitals to procure appropriate waste containers, storage facilities, and transportation equipment, while guidelines provide clear procedural directions for personnel responsible for waste handling. This finding is consistent with the observations of Dang et al. (2020) and Raji and Adeogun (2024), who noted that healthcare facilities with sufficient financial resources and well-defined operational policies tend to achieve higher compliance with healthcare waste management standards.

On the other hand, the weakest relationships were consistently observed in segregation. Correlation coefficients between segregation and the related factors ranged only from .06 to .11, all of which are very weak and non-significant. This suggests that segregation practices may already be routinely integrated at the point of waste generation and are less dependent on higher-level administrative or structural factors. In other words, segregation may be more behavior-based and standardized across facilities regardless of variations in budget, committees, or supervision. Similar findings were reported by Ibrahim et al. (2023) and Jangre et al. (2023), who emphasized that waste segregation is often embedded in routine healthcare practices and is widely implemented due to its critical role in infection control and waste management safety.
Overall, strong institutional foundations—such as policies, funding, training resources, supervision, and available utilities—are closely associated with better implementation of waste management practices. This result supports the broader literature emphasizing that effective healthcare waste management systems depend largely on institutional governance, resource allocation, and structured operational frameworks (Windfeld & Brooks, 2019; WHO, 2020; Raji & Adeogun, 2024).

Level of financial and operational challenges/barriers faced by the private hospitals in healthcare waste management

Table 9 presents the perceived financial challenges encountered by private hospitals in implementing healthcare waste management practices.

	Management /PCO		Utility Worker		Medical Staff		As a Whole	
Financial Challenges/Barriers	**Mean**	**DR**	**Mean**	**DR**	**Mean**	**DR**	**Mean**	**DR**
1. There is no sufficient budget allocation for healthcare waste management in the facility.	2.27	D	2.35	D	2.21	D	2.24	D
2. Financial constraints limit procurement of necessary waste management equipment and supplies.	2.27	D	2.32	D	2.23	D	2.26	D
3. The cost of proper healthcare waste disposal services is not manageable within operational budget.	2.36	D	2.35	D	2.12	D	2.19	D
4. Funding for training staff on healthcare waste management is inadequate and inconsistent.	2.18	D	2.35	D	2.11	D	2.17	D
5. Financial support is unavailable to maintain waste treatment infrastructure such as incinerators.	2.00	D	2.41	D	2.17	D	2.21	D
6. Lack of financial resources hinder compliance with healthcare waste regulations.	2.00	D	2.32	D	2.19	D	2.21	D
7. Investments in improved waste segregation materials and protective gear does not meet current needs.	2.27	D	2.18	D	2.17	D	2.18	D
8. Financial incentives or support programs are not enough to aid in improving waste management practices.	2.00	D	2.35	D	2.27	D	2.27	D
9. Overall financial planning inadequately addresses the needs of healthcare waste management activities.	2.55	D	2.47	D	2.25	D	2.32	D
10. Financial barriers cause delays or gaps in healthcare waste management processes.	2.27	D	2.41	D	2.19	D	2.24	D
Overall	**2.22**	**L**	**2.35**	**L**	**2.19**	**L**	**2.23**	**L**

Table 9. Item Mean Ratings on the Level of Financial Challenges/Barriers

Statistical Range	Item Descriptive Rating	Overall Descriptive Rating
4.21-5.00	Strongly Agree (SA)	Very High (VH)
3.41-4.20	Agree (A)	High (H)
2.61-3.40	Neutral (N)	Fair (F)
1.81-2.60	Disagree (D)	Low (L)
1.00-1.80	Strongly Disagree (S)	Very Low (VL)

As a whole, the level of financial challenges/barriers encountered by private hospitals was rated low, with an overall mean of 2.23. This indicates that financial constraints are generally not perceived as major barriers in the implementation of healthcare waste management practices in the participating hospitals. The result suggests that hospitals may already have sufficient financial planning and resource allocation mechanisms that support healthcare waste management activities. This observation is consistent with Windfeld and Brooks (2019) and the World Health Organization (2020), which emphasized that healthcare facilities with established waste management systems often integrate waste management costs into their routine operational budgets to ensure compliance with environmental and public health standards.

Among the indicators, the highest mean rating was observed in the statement that overall financial planning inadequately addresses the needs of healthcare waste management activities (mean of 2.32). Although this item received the highest rating among the indicators, it still falls within the low level, indicating that financial planning concerns exist but are not considered major obstacles to the implementation of healthcare waste management practices. This finding aligns with Sepetis et al. (2022), who noted that financial planning for healthcare waste management is an important component of hospital operations, particularly in ensuring that waste treatment, disposal, and compliance requirements are sustainably supported.

On the other hand, the lowest mean rating was recorded in the statement that funding for training staff on healthcare waste management is inadequate and inconsistent (mean of 2.17). This suggests that respondents generally do not perceive training-related funding as a major concern, implying that training programs or capacity-building initiatives related to healthcare waste management may already be available in the hospitals. Studies by Kenny and Priyadarshini (2021) also highlighted that continuous training and staff capacity-building are commonly integrated into healthcare waste management systems to ensure proper compliance with safety and environmental regulations.

When respondents were grouped according to their roles, utility workers reported the highest perception of financial challenges (mean of 2.35), followed by management/PCO (mean of 2.22), while medical staff registered the lowest mean rating (mean of 2.19). Despite these differences, all respondent groups rated financial challenges at a Low level, indicating a shared perception that financial factors do not significantly hinder the implementation of healthcare waste management practices in their hospitals. This finding supports the observation of Raji and Adeogun (2024), who emphasized that when healthcare waste management systems are institutionalized within hospital operations, financial barriers tend to be minimized as part of routine management and regulatory compliance efforts.

Table 10 presents the perceived operational challenges encountered by private hospitals in implementing healthcare waste management practices.

	Management /PCO		**Utility Worker**		**Medical Staff**		**As a Whole**	
Operational Challenges/Barriers	**Mean**	**DR**	**Mean**	**DR**	**Mean**	**DR**	**Mean**	**DR**
1. Operational procedures for segregation, collection, and disposal of healthcare waste are not consistently followed.	2.18	D	2.26	D	2.30	D	2.29	D
2. Healthcare waste management equipment and supplies are not always available and functional when needed.	1.91	D	2.44	D	2.23	D	2.26	D
3. Staff do not receive continuous and effective training on healthcare waste management practices.	2.09	D	2.41	D	2.20	D	2.24	D
4. There are significant delays in waste collection schedules within the healthcare facility.	1.73	S	2.29	D	2.20	D	2.19	D
5. Communication and coordination between departments on waste management are not effective.	2.09	D	2.50	D	2.17	D	2.23	D
6. Adequate storage facilities are not available to temporarily hold healthcare waste safely and securely.	2.18	D	2.29	D	2.21	D	2.23	D
7. Operational barriers prevent compliance with healthcare waste management policies.	2.27	D	2.32	D	2.06	D	2.13	D
8. Waste management documentation and record-keeping processes are not consistently maintained.	2.36	D	2.41	D	2.10	D	2.18	D
9. Handling and transportation of healthcare waste within the facility does not meet safety and hygiene standards.	2.09	D	2.38	D	2.14	D	2.19	D
10. Staffing levels are not sufficient to manage healthcare waste operations without excessive workload.	2.18	D	2.29	D	2.20	D	2.22	D
Overall	**2.11**	**L**	**2.36**	**L**	**2.18**	**L**	**2.21**	**L**

Table 10. Item Mean Ratings on the Level of Operational Challenges/Barriers

As a whole, the level of operational challenges/barriers encountered by private hospitals was rated low, with an overall mean of 2.21. This indicates that operational issues are generally not perceived as major barriers in the implementation of healthcare waste management practices in the participating hospitals. The result suggests that hospitals may have already established operational systems and procedures that support the effective management of healthcare waste. This finding is consistent with Windfeld and Brooks (2019) and the World Health Organization (2020), which emphasized that structured operational systems, clear procedures, and routine monitoring are essential components of effective healthcare waste management programs in healthcare facilities.

Among the indicators, the highest mean rating was observed in the statement that operational procedures for segregation, collection, and disposal of healthcare waste are not consistently followed (mean of 2.29). Although this item received the highest rating among the indicators, it still falls within the low level, indicating that inconsistencies in operational procedures exist but are not considered significant operational barriers. This finding supports the observation of Dang et al. (2020), who noted that while healthcare facilities may experience minor inconsistencies in operational procedures, the presence of established guidelines and supervision generally helps maintain compliance with healthcare waste management practices.

On the other hand, the lowest mean rating was recorded in the statement that operational barriers prevent compliance with healthcare waste management policies (mean of 2.13). This suggests that respondents generally do not perceive operational limitations as a major factor preventing compliance with healthcare waste management policies. Similar findings were reported by Lee and Lee (2022), who emphasized that healthcare institutions with established management systems and operational protocols are more capable of sustaining compliance with waste management regulations and standards.

When respondents were grouped according to their roles, utility workers reported the highest perception of operational challenges (mean of 2.36), followed by medical staff (mean of 2.18), while management/PCO registered the lowest mean rating (mean of 2.11). Despite these differences, all respondent groups rated operational challenges at a Low level, indicating a common perception that operational factors do not significantly hinder the implementation of healthcare waste management practices in their hospitals. This observation aligns with Raji and Adeogun (2024), who highlighted that when operational procedures and responsibilities are clearly defined within healthcare institutions, operational barriers tend to have minimal impact on the effectiveness of healthcare waste management systems.

Conclusion and Implications

From the findings of the study, the following conclusions were drawn:

1. Private hospitals in the first district of Ilocos Sur are generally small- to medium-sized facilities operating with minimal capital but supported by a relatively stable and educated workforce. The personnel are mainly middle-aged, predominantly male, and have participated in healthcare waste management–related trainings. This profile suggests that while hospitals may not have extensive institutional capacity compared to larger tertiary centers, they possess a human resource base capable of sustaining structured waste management programs.
2. Healthcare waste management–related factors are well established within these hospitals. The high ratings in budget allocation, presence of guidelines, training manuals, supervision, waste management committees, and availability of utilities indicate that organizational structures and operational systems are in place. This reflects institutional commitment to environmental safety, regulatory compliance, and occupational health protection.
3. The level of healthcare waste management practices is consistently high across all functional areas. From segregation to disposal, including documentation and occupational safety. This demonstrates that waste management procedures are not merely documented policies but are generally implemented in operational practices within the hospitals.
4. Personal-related factors have limited overall influence on healthcare waste management practices. Demographic characteristics such as age, length of service, employment status, and sex do not significantly determine compliance. However, role assignment, educational attainment, and participation in related training programs influence specific operational tasks, particularly segregation and storage. This suggests that competency development and clearly defined responsibilities are more critical than personal characteristics in ensuring effective implementation. On the other hand, hospital-related structural characteristics significantly influence

healthcare waste management practices. Facilities with larger bed capacity, higher level classification, broader service scope, and greater waste generation tend to implement more systematic and structured waste management systems. This implies that institutional capacity and operational complexity drive the strengthening of environmental and safety management systems.

5. Healthcare waste management-related factors which includes budget allocation, presence of guidelines, training manuals, supervision, presence of waste management committee, and availability of waste management utilities, have a strong and direct influence on healthcare waste management practices. The findings affirm that effective waste management is primarily influenced by organizational commitment. Leadership support, operational readiness, and coordinated institutional mechanisms are key drivers of compliance and sustainability.
6. Financial and operational challenges are present but generally at a low level. While constraints related to funding, infrastructure maintenance, staffing, and coordination exist, they are not strongly perceived as major barriers. Nevertheless, these challenges may affect consistency and long-term sustainability if not continuously addressed. Sustained financial planning, ongoing training, and strengthened operational monitoring will be essential in maintaining and further enhancing healthcare waste management systems.

From the findings and conclusions of the study, the following recommendations are forwarded:

1. Private hospitals may continue strengthening their human resource capability and organizational readiness in healthcare waste management. Since the respondents were generally young to middle-aged, regularly educated, and trained, hospitals may sustain professional development initiatives, mentoring, and role-based capacity building to further reinforce competence and accountability in waste management implementation.
2. Hospitals may sustain and regularly review healthcare waste management-related factors such as budget allocation, guidelines, supervision, training manuals, and availability of utilities. The study showed that these factors were rated High and significantly influenced healthcare waste management practices. Particular attention may be given to strengthening training manuals and budget allocation. Training manuals must be regularly updated, simplified when necessary, and aligned with current national and international standards to ensure that procedures are clearly understood by all personnel, especially frontline waste handlers. Hospitals may also consider integrating competency-based modules and practical demonstrations to make training materials more responsive to operational realities.
3. Hospitals may continue reinforcing the consistent implementation of healthcare waste management practices across all functional areas. Given the high level of practices observed in segregation, collection, storage, transportation, treatment, disposal, minimization, documentation, and occupational safety, hospital management should sustain standard operating procedures, reinforce compliance monitoring, and recognize good practices among staff to maintain performance. Hospitals may adopt more structured waste reduction strategies such as conducting regular waste audits, promoting environmentally responsible procurement and minimizing unnecessary use of disposable materials. Enhancing staff awareness and participation in waste reduction efforts, especially at the operational level, can further improve sustainability outcomes.
4. Hospitals may strengthen role clarity and targeted training for personnel directly involved in waste management operations. Since role assignment, educational attainment, and participation in training influenced segregation and storage practices, clarifying responsibilities and expanding competency-based training especially for the utility workers, can further improve operational efficiency. Hospital administrators may adopt strategies tailored to institutional capacity and operational demands. Findings showed that bed capacity, level classification, services offered, and total waste generation significantly influence waste management practices. Smaller hospitals may benefit from shared services, technical assistance, and collaboration with larger facilities to strengthen their systems.
5. Hospitals may sustain strong organizational leadership and governance in healthcare waste management. Supervision, guidelines, committees, training resources, and utilities were found to strongly influence implementation. Strengthening committee functions, ensuring leadership involvement, and promoting coordination across departments will support long-term program effectiveness.
6. Hospitals may proactively address financial and operational challenges to ensure long-term sustainability. Although these challenges were rated Low, continued attention to funding, staffing, infrastructure maintenance, and coordination is necessary. Integrating waste management into long-term planning, strengthening monitoring systems, and sustaining training initiatives will help maintain and further enhance healthcare waste management practices over time.

7. Future studies may build on the findings of this research by expanding the scope to include public hospitals, other districts, or different levels of healthcare institutions. Since this study focused solely on private hospitals in the first district of Ilocos Sur, examining a wider range of facilities may provide a clearer and more comprehensive picture of how healthcare waste management practices vary on different settings.

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Competing Interests Statement

The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

Data Availability Statement

The data supporting this study are available from the corresponding author upon reasonable request.

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Appendices

Appendix A. Survey Questionnaire

This appendix contains the complete survey instruments used in this study to assess healthcare waste management practices of private hospitals in the first district of Ilocos Sur, administered to 160 respondents composed of management personnel or Pollution Control Officers (PCOs), medical staff, and utility workers from eleven private hospitals. The questionnaires include Likert-scale items (1 = Strongly Disagree to 5 = Strongly Agree) designed to measure the key variables of the study. The survey collected information on personal-related factors of the respondents, including age, sex, length of service, highest educational attainment, and number of related training programs, as well as hospital-related factors such as location, bed capacity, level classification, services offered, permits and licenses, and total waste generated per day. The instrument also assessed healthcare waste management–related institutional factors, including budget allocation, presence of guidelines, training manuals, supervision, presence of a waste management committee, and availability of waste management utilities. In addition, the questionnaire evaluated healthcare waste management practices across segregation, collection, storage, transportation, treatment, disposal, waste minimization, documentation and

reporting, and occupational safety and personal protective equipment. The instrument further included items designed to determine the financial and operational challenges encountered by hospitals in implementing healthcare waste management practices. The questionnaire items were developed based on the objectives of the study, relevant literature, and established healthcare waste management guidelines, particularly the World Health Organization manual on the safe management of healthcare waste.